097.3
Z1092R
#2561.1

RESTRICTED

OFFICE OF STRATEGIC SERVICES
Research and Analysis Branch

RECEIVED
MAY 14 1945
DOCUMENT SECURITY
FEA

R & A No. 2561.1

161338
FEA RESTRICTED

TRANSPORTATION IN YUGOSLAVIA

Railroads

DEPARTMENT OF STATE
REFERENCE DIVISION
FILE COPY
PLEASE RETURN

A study of railroads in
Yugoslavia: lines, equipment,
operation, traffic, and
administration

17 November 1944

Copy No.________

RESTRICTED

(69812)

SUMMARY

The Yugoslav railroad system of approximately 7,000 miles has a higher density than the other railroads in the Balkans; the density, however, is not evenly distributed throughout the country. Only two-thirds of the lines are standard-gauge, and many vital areas are connected by an extended network of narrow-gauge lines. Most lines are single track. Pre-war standards of construction, and maintenance of permanent way and equipment were below those of Central and Western European countries. Heavy traffic could be handled on a few lines only. In recent years facilities and equipment have suffered greatly from warfare, so that much repair work will have to be done after the cessation of hostilities. Prior to the war the greater part of the railroads was operated as a national system. After the invasion of Yugoslavia, they were divided among Serbia, Croatia, Bulgaria, Italy, Germany, Hungary, and Albania.

TRANSPORTATION IN YUGOSLAVIA

RAILROADS

A. Pattern of the System

1. Density. The Yugoslavian railroads, a system of 11,219 km. (6,989 miles), form a network of moderate density (Map No. 5447). The density is higher than in other Balkan countries but lower than in the principal European countries (Table 1). The network, however, is not evenly distributed throughout Yugoslavia. In the populous regions of the north which belonged to Austria and to Hungary prior to World War I, the railroad system had been well developed, while in the former Austro-Hungarian provinces of Bosnia and Herzegovina railroad construction had made little progress. In Serbia proper the density of the system had been somewhat higher than in Bosnia, but still smaller than in the north. In the period between World War I and the German invasion of the Balkans, the Yugoslav Government, because of its limited financial strength, was unable to change decisively this unfavorable distribution of the network, since terrain difficulties made railroad construction extremely expensive in many regions.

Table 1. RAILROAD DENSITY IN YUGOSLAVIA

	Area sq. miles	Population	Population per sq. mile	RAILROAD MILEAGE		
				miles	per 100 sq. miles	per 10,000 population
Yugoslavia	95,849	15,400,000	161	6,989	7.3	4.5
		For Comparison				
Greece	50,180	6,933,000	140	1,708	3.4	2.5
Rumania	113,884	19,933,000	175	7,068	6.2	3.6
Bulgaria	39,825	6,385,000	160	2,261	5.7	3.5
Italy	119,764	42,445,000	360	14,255	11.9	3.2
France	206,776	39,300,000	190	27,307	13.3	7.0
United Kingdom	96,000	47,485,000	494	20,682	21.5	4.4
United States	3,027,000	131,669,000	43	251,819	8.3	18.6
Germany (Proper)	186,080	73,692,000	395	38,864	20.8	5.3

2. Main Lines and International Connections.[1] The main artery of the system is the line from the former Austrian border near Jesenice to the Bulgarian border at Caribrod, known as the Orient Express Line (line 1). This line follows the Sava Valley as far as Belgrade. South of the capital it continues through the Morava Valley to Nis, and then along the Nisava Valley to the Bulgarian border. Various sections of the line are double track. There are in addition alternate sections of the Orient Express Line (line 1), such as that from Zagreb to Nosvka via Dugo Selo (line 17), and that from Belgrade to Velika Plana via M. Krisna (lines 38 and 39). Line 1 is the principal link between Central Europe and the Balkans. In the northwest it connects directly with the Austrian and Italian railroad systems over sidelines (lines 2, 3, 4, 5 and 7). The main connections with Hungary and Rumania join line 1 from the northeast at Zagreb and from the north near Belgrade. The line continues to the Turkish border, and within Turkey to Istanbul. Nis is the junction for the connection by way of Skoplje and Veles (lines 45 and 47) to Salonika and Athens (see Table 2).

---

[1] On Map No. 5447 and Tables 2 to 6, railroad lines are numbered to correspond with numbers in the text. Line numbers 1 to 47 refer to principal national standard-gauge lines; 101 to 163 to secondary national standard-gauge lines; 201 to 226 to secondary national narrow-gauge lines; 301 to 321 to private lines (narrow-gauge); 401 to 440 to international connections; 501 to 512 lines under construction; and 601 to 613 to projected lines.

Numerous lines run from north to south between the Sava and Drava valleys, and in the area east of the Danube. They are linked by various transverse routes. Some of the lines in this area extend into Hungary and Rumania in the north and northeast. In addition to the Italian connections, the Adriatic Sea can be reached by the standard-gauge line from Ljubljana to Susak near Fiume, and from Zagreb to Susak and Split. Another connection to the Adriatic Sea is available over the narrow-gauge system (2'5½") which extends from Brod and from Belgrade (both on line 1) to Sarajevo (lines 203 and 210), the main point in Bosnia, and which continues from there to Dubrovnik (line 203). In Serbia a second route to Skoplje (line 41) branches from line 1 at Lapovo, and a line from Veles (on line 47) reaches the Greek border north of Florina via Bitolj. New connections with Bulgaria proper are under construction. (For international connections see Table 6).

3. Lines of Secondary Importance. In addition to these main routes, various standard- and narrow-gauge branch lines run to places of minor importance in the interior of the country.

4. General Characteristics of the System. Prior to the war heavy and speedy traffic could be handled only on a few lines, whereas the efficiency of most other parts of the system was limited. In recent years extensive internal warfare and constant sabotage have resulted in severe damage

to railroad facilities. The Bosnian narrow-gauge system and the standard-gauge lines southwest of Zagreb were particularly exposed to continuous attack. Under present conditions the possibility of using Yugoslav railroads for passenger and freight transportation is even more limited than before the war.

5. Length and Classification of Lines. A classification of Yugoslav railroad lines is given below:

	Km.	Miles
Principal national railroads (Table 2)	6,168	3,835
Secondary national railroads		
(a) standard-gauge (Table 3)	1,560	971
(b) narrow-gauge (Table 4)	2,446	1,524
Total national railroads	10,174	6,330
Total private railroads (Table 5)	1,045	659
Total Yugoslav railroads	11,219	6,989

Characteristics of individual lines vary considerably, as is indicated in Tables 2-5.

Table 2. PRINCIPAL NATIONAL RAILROADS IN YUGOSLAVIA AND THEIR CHARACTERISTICS, 1944

Standard Gauge

Line	Length of line		Double track		Maximum distance between stations		Maximum grade	Maximum curvature	Maximum axle load	
	km.	miles	km.	miles	km.	miles	percent	degrees	Metric tons	Section of line
(Rosenbach-) Yugoslavian Frontier-Jesenice-Sisak-Belgrade-Nis-Caribrod-Bulgarian Frontier (-Sofia)[a]	994	618	458[b]	285[b]	12	8	1.5	6°4'	18 15 16 14.5	Zapresic-Sisak; Novska-Nis Sisak-Novska Ljubljana-Zapresic; Nis-Caribrod Jesenice-Ljubljana
Jesenice-Ratece Planica-Italian Frontier (-Tarvisio)	34	21	-	-	c	c	c	c	14.5	
Jesenice-Bistrica B. Jezero-Wocheiner Tunnel-Italian Frontier (-Piedicolle)	38	24	-	-	5	3	1.85	7°	16	
Ljubljana-Rakek-Italian Frontier (-Postumia)	53	33	53	33	9	6	1.1	7°	16	
Celje-Dravograd Meza-Austrian Frontier (-Lauemund)	87	54	-	-	9	6	2.4	c	12 14.5	Celje-Velenje Velenje-Dravograd Meza
Maribor-Prevalje-Austrian Frontier (-Bleiburg)	88	55	-	-	12	8	1.45	7°9'	14.5	
Zidani Most-Maribor-Sent. Ilj-Austrian Frontier (-Spielfeld Strass)	110	68	110	68	10	6	.8	8°7'	16	
Pragersko-Kotoriba-Hungarian Frontier (-Murakenesztur)	96	60	-	-	9	6	.45	c	16	
Ormoz-Hodos-Hungarian Frontier (-Zalaegerszeg)	70	44	-	-	7	4	1.45	c	13 12	Ormoz-Sobota Sobota-Hodos
Zapresic-Donja Londava-Hungarian Frontier (-Redics)	129	80	-	-	11	7	1.7	c	12.5	

Table 2 (cont'd)

Line	Length of line		Double track		Maximum distance between stations		Maximum grade	Maximum curvature	Maximum axle load	
	km.	miles	km.	miles	km.	miles	percent	degrees	Metric tons	Section of line
Dugo Selo-Koprivnica-Hungarian Frontier (-Gyekenyes)	81	50	-	-	9	6	.7	c	16) 15)	Dugo Selo-Koprivnica Koprivnica-Gyekenyes
(Sisak-) Caprag-Karlovac-Ljubljana	270	168	-	-	13	8	2.5	c	12.5) 14.0) 14.5)	Caprag-Karlovac Karlovac-Bubnjarci Bubnjarci-Ljubljana
Zagreb-Split[d]	424	264	-	-	12	8	2.5	6°4'	15) 14.5)	Zagreb-Ogulin; Knin-Split Ogulin-Knin
(Ljubljana-) Grosuplje-Kocevje	48	30	-	-	9	6	2.15	c	14.5	
Ostarije-Susak-Italian Frontier (-Fiume)	126	78	-	-	9	6	2.5	6°4'	16	
Ljutomer-Gornja Radgona-Austrian Frontier (-Radkersburg)	22	14	-	-	c	c	c	c	14	
Zagreb-Dugo Selo-Novska	118	73	-	-	8	5	.5	c	16	
Varazdin-Dalj	249	155	-	-	10	6	.8	c	14) 15) 12.5)	Dalj-Osijek Osijek-Virovitica; Koprivnica-Varazdin Virovitica-Koprivnica
Osijek-Beli Monastir-Frontier (-Magyarboli)	45	28	-	-	8	5	.5	c	14	
Osijek-Vinkovci	34	21	-	-	9	6	.5	c	12.5	
Sunja-Banja Luka	131	81	-	-	12	8	2.0	c	14	
Vinkovci-Subotica-Velika Kikinda	226	140	-	-	11	7	1	c	14) 15)	Vinkovci-Dalj; Subotica-Velika Kikinda Dalj-Subotica

Table 2 (cont'd)

Line	Length of line km.	Length of line miles	Double track km.	Double track miles	Maximum distance between stations km.	Maximum distance between stations miles	Maximum grade percent	Maximum curvature degrees	Maximum axle load Metric tons	Maximum axle load Section of line
Novi Sad-Odzaci-Sombor	92	57	-	-	14	9	.45	c	12.5 12	Novi Sad-Stari Futog Stari Futog-Sombor
Stari Becej-Sombor	91	57	-	-	11	7	.4	c	12	
Bogojevo-Odzaci-Subotica	102	63	-	-	9	6	.5	c	12.5	
Subotica-Novi Sad-Indjija	136	85	-	-	9	6	1.25	c	14 15	Indjija-Novi Sad Novi Sad-Subotica
Subotica-Subotica Salasi-Hungarian Frontier (-Bacsalmas)	22	14	-	-	c	c	c	c	15 12	Subotica-Subotica Fabrica Subotica Fabrica-Subotica Salasi
Subotica-Hungarian Frontier (-Kelebia)	13	8	-	-	c	c	c	c	15	
Subotica-Horgos-Hungarian Frontier (-Kameras Suma)	28	17	-	-	9	6	.45	c	15	
Novi Sad-Horgos	135	84	-	-	12	8	.5	c	12 11	Novi Sad-Senta Senta-Horgos
(Novi Sad-) Rimski Sancevi-Orlovat	63	39	-	-	10	6	.9	c	12	
Pancevo-Dragutinovo	126	78	-	-	12	8	.6	c	12	
Velika Kikinda-Rumanian Frontier (-Jimbolea)	20	12	-	-	c	c	c	c	14	
Jasenovo-Jam-Rumanian Frontier (-Cravita-Anina)	9	6	-	-	c	c	c	c	17	

Table 2 (cont'd)

Line	Length of line km.	Length of line miles	Double track km.	Double track miles	Maximum distance between stations km.	Maximum distance between stations miles	Maximum grade percent	Maximum curvature degrees	Maximum axle load Metric tons	Maximum axle load Section of line
Aleksandrovo-Bela Crkva-Rumanian Frontier (-Bazias)	125	78	-	-	10	6	.6	c	12.5)) 15)	Banatsko Aleksandrovo-Vrsac Vrsac-Bela Orkva
Belgrade-Vrsac-Vatin-Rumanian Frontier (-Voiteni)	106	66	-	-	16	10	1	c	16)) 12.5)) 12.0)	Belgrade-Pancevo Predgradje Pancevo Predgradje- Pancevo Pancevo-Vrsac
Kovin Dunau-Secanj-Nincicevo-Rumanian Frontier (-Jonel)^{e}	120	75	-	-	11	7	1	c	10)) 12.5) 12) 11)	Kovin Dunau- Vladimirovac Vladimirovac-Alibunar Alibunar-Secanj Secanj-Nincicevo
(Belgrade-) Topcider-Kucevo^{f}	148	92	-	-	13	8	.8	c	15) 16)	Topcider-Pozarevac Pozarevac-Kucevo
Smederevo-Velika Plana^{c}	47	29	-	-	12	8	1.2	c	14	
Indjija-Indjija Selo (spur line)	2	1	-	-	c	c	c	c	18	
Lapovo-Kraljevo-Skoplje	339	211	-	-	15	9	1.7	6°4'	16) 13)	Lapovo-Grlica Grlica-Skoplje
Prahovo-Nis^{g}	194	121	-	-	10	6	2	7°	15) 18)	Prahovo-Crveni Krst Crveni Krst-Nis
Doljevac-Kursumlija^{h}	59	37	-	-	10	6	.8	c	14	
Pristina-Pec^{h}	92	57	-	-	10	6	c	c	16	

Table 2 (cont'd)

	Lines	Length of line km.	Length of line miles	Double track km.	Double track miles	Maximum distance between stations km.	Maximum distance between stations miles	Maximum grade percent	Maximum curvature degrees	Maximum axle load Metric tons	Maximum axle load Section of line
5	Nis-Skoplje-Djevdjelija-Greek Frontier (-Eyzenon)	389	242	-	-	15	9	1.5	9°7'	14	
6	Veles-Kocane^{j}	87	54	-	-	10	6	1.5	c	14	
7	Veles-Bitolj-Kremenica-Greek Frontier (-Skydra)	150	93	-	-	10	6	1.05	c	16) 17)	Veles-Bitolj Bitolj-Kremenica
	Total	6,168	3,835	621	386						

From Paracin to Stalac and connecting with the Stalac to Cacak narrow gauge route (line 220) as far as Krusevac (line 160), a third rail is used inside the standard gauge tracks.

Double track sections of this line are: Rosenbach-Jesenice (10 km.; 6 miles); Ljubljana-Zidani Most (64 km.; 40 miles); Zagreb-Dobova (25 km.; 16 miles); Novska-Ripanjski Tunel (340 km.; 211 miles); Lapovo-Veliko Plana (19 km.; 12 miles).

Information not available.

Narrow gauge line (2'5½") from Sinj to Split uses third rail inside standard gauge track of this line from beyond Solin to Split.

Train ferry provides rail connection from port of Kovin Dunau across the Danube to port of Smederevo.

Line under construction to Negotin and Turnu Severin. This will considerably shorten the distance between Belgrade and Bucharest.

Rail connection to port of Prahovo.

It will connect with the Kursumlija-Pristina branch now under construction.

Line under construction from Kocane to Gorna Dzhumaya in Bulgaria.

Table 3. SECONDARY YUGOSLAVIAN NATIONAL RAILROADS AND THEIR CHARACTERISTICS, 1944

Standard Gauge Lines

		Length of line		Maximum axle load	
		km.	miles	Metric tons	Section of line
101	Kranj-Trzic	16	10	14	
102	Ljubljana-Brezovica-Vrhnica	21	13	13	
103	Ljubljana-Kamnik	24	15	11	
104	Sveti Vid-Crnuce-Podbost-Laze	25	16	a	
105	Ogulin-Jossipdol	5	3	14.5	
106	Skrljevo-Bakar	12	7	15	
107	Perkovic Slivno-Sibenik[b]	22	14	15	
108	Bosanski Novi-Bihac[c]	66	41	12.5	
109	Novo Mesto-Straza Toplice	9	6	14.5	
110	Sevnica-Trebnje na Dol	33	21	14.5	
111	Trzisce-Janz na Dol	3	2	a	
112	Slovenska Bistrica-Slovenska Bistrica Mesto	4	3	13	
113	Maribor Loop line	5	3	a	
114	Pragersko Loop line	2	1	a	
115	Zabok-Grobelno[d]	70	44	12.5)	Zabok-Krapina
				14.0)	Krapina-Grobelno
116	(Zabok-) Bracak-Gornja Stubica	13	8	12	

Table 3 (cont'd)

		Length of line		Maximum axle load	
		km.	miles	Metric tons	Section of line
117	Varazdin-Golubovec	34	21	12.5	
118	Zidanimost Loop line	5	3	a	
119	Krizevci-Bjelovar-Klostar	65	40	12.5	
120	Bjelovar-Bjelovar Mlin	3	2	12.5	
121	Bjelovar-Garesnica	55	34	12.5	
122	Sveta Klara-Hrvatski Leskovac (Zagreb Loop line)	2	1	14.7	
123	Pavlovac-Drazica-Grubisno Polje	15	9	12.5	
124	Banova Jaruga-Suhopolje[e]	101	63	12	
125	Bastaji-Koncanica	15	9	12	
126	Virovitica-Hungarian Frontier (-Barcs)	17	11	12	
127	Podravska Slatina-Noskovci-Hungarian Frontier (-D. Zalata)	23	14	12.5	
128	Pleternica-Velika	26	16	12	
129	Nasice-Nova Kapela Batrina[f]	60	37	12.5	
130	Osijek-Strizivojna Vrpolje-Samac[g]	69	43	12.5	
131	Vinkovci-Zupanja Sava	35	22	12.5	
132	Vinkovci-Brcko	62	39	12.5	

Table 3 (cont'd)

		Length of line		Maximum axle load	
		km.	miles	Metric tons	Section of line
133	Ilača-Vukovar-Vukovar Predgrade	31	19	12.5) 15.0)	Ilaca-Vukovar Vukovar-Vukovar Predgrade
134	Beli Monastir-Bar Petrovo Selo-Hungarian Frontier (-Harkany)	10	6	12.5	
135	Beli Monastir-Batina Skela	27	17	12.5	
136	Odzaci-Sonta-Apatin-Sombor	58	36	12	
137	Slavonski Brod-Bosanski Brod[h]	2	1	13	
138	Sombor-Backi Breg-Hungarian Frontier (-Herczegszanta)	38	24	12	
139	Sombor-Ridica-Hungarian Frontier (-Gara)	36	22	12	
140	Ridica-Clegyens-Hungarian Frontier (-Bacsalmas)	6	4	12	
141	Karavukovo-Nova Palanka	34	21	12.5	
142	Sekic-Kula-Nova Palanka	57	35	12	
143	Novi Sad-Stari Futog	9	6	12.5	
144	Sid-Sremska Raka	30	19	12.5	
145	Ruma-Vrdnik-Uglejevik	21	13	12	
146	Ruma-Sabac	39	24	12	

Table 3 (cont'd)

		Length of line		Maximum axle load	
		km.	miles	Metric tons	Section of line
147	Batajnica-Boljevci Sava	22	14	14	
148	Petrovaradin-Beocin	18	11	12.5	
149	Sremska Mitrovica-Sremska Mitrovica Sava bridge	3	2	15	
150	Zednik-Cantavir	9	6	12	
151	Coka-Dala-Hungarian Frontier (-Szoreg)	32	20	12.5	
152	Velika Kikinda-Banatsko Arandelovo-Hungarian Frontier (-Szoreg)	44	27	12	
153	Velika Kikinda-Nakovo-Rumanian Frontier (-Comlosul Mare)	14	9	12	
154	Valkani-Rumanian Frontier (-Vocho)	4	3	13.2	
155	Jasa Tomic-Rumanian Frontier (-Kruceni)	3	2	10	
156	Cot-Boka-Sucjac-Rumanian Frontier (-Banioc)	18	11	13	
157	Kovacica-Samos	21	13	12.5	
158	Vrsac-Velika Srediste-Rumanian Frontier (-Veliki Zam)	20	12	12	
159	Pancevo Predgradje-Pancevo	6	4	12.5	
160	(Paracin-) Stalac-Krusevac[1]	15	9	14	
161	Dedine-Obilicevo	3	2	14	

Table 3 (cont'd)

		Length of line		Maximum axle load	
		km.	miles	Metric tons	Section of line
162	Nis Loop line	9	6	a	
163	Prahovo Selo-Kusjak	4	3	a	
	Total	1,560	971		

---

a Information not available.

b Rail connection with port at Sibenik. Maximum distance between stations -- 10 km. (6 miles). Maximum grade 2.25 percent.

c Maximum distance between stations -- 12 km. (8 miles). Maximum grade .6 percent.

d Maximum distance between stations -- 10 km. (6 miles). Maximum grade 2.5 percent.

e Maximum distance between stations -- 13 km. (8 miles). Maximum grade 1.5 percent.

f Maximum distance between stations -- 8 km. (5 miles). Maximum grade 1.5 percent.

g Maximum distance between stations -- 14 km. (9 miles). Maximum grade .8 percent.

h Standard gauge line crosses bridge over Sava River connecting Slavonski Brod with Bosanski Brod.

i From Paracin to Stalac and from Stalac to Krusevac a third rail is used inside the standard gauge tracks. Maximum distance between stations is 8 km. (5 miles).

Table 4. SECONDARY YUGOSLAVIAN NATIONAL RAILROADS AND THEIR CHARACTERISTICS, 1944

Narrow Gauge Lines

		Length of line km.	Length of line miles	Remarks
I.	Gauge 2'5½"			
201	Poljcane-Zrece	21	13	
202	Split-Sinj	54	34	From beyond Selin to Split, third rail is used inside standard gauge track. Maximum distance between stations 9 km. (6 miles). Maximum grade 2.5 percent. Maximum curvature 5°8'.
203	Slavonski Brod-Dubrovnik	584	363	Maximum distance between stations 12 km. (8 miles). Maximum grade 6 percent. Maximum curvature 29°1'. Maximum axle load 8 metric tons from Slavonski Brod to Konjic and Mostar to Dubrovnik; 7 metric tons from Konjic to Mostar.
204	Jajce-Lasva	107	67	Maximum distance between stations 11 km. (7 miles). Maximum grade rack station 4.5 percent. Maximum axle load 8 metric tons.
205	Bugojno-Donji Vakuf	11	7	
206	Gabela-Metkovic-Rogotin-Ploce	25	16	
207	Doboj-Simin Han	67	42	
208	Karanovac-Gracanica	5	3	
209	Podlugovi-Vares	28	17	
210	Belgrade-Sarajevo	444	276	Maximum distance between stations 15 km. (9 miles). Maximum grade 1.8 percent. Maximum curvature 22°7'. Maximum axle load 8.5 metric tons from Belgrade to Vardiste; 8 metric tons from Vardiste to Sarajevo.

Table 4 (cont'd)

		Length of line		Remarks
		km.	miles	
211	Ilidze-Ilidze Banja	2	1	
212	Ustipraca-Foca	42	26	
213	Medjedja-Priboj na Limu	49	31	
214	Hum-Niksic	125	78	Maximum distance between stations 8 km. (5 miles). Maximum grade 2.8 percent. Maximum curvature 29°1'. Maximum axle load 8 metric tons.
215	Uskoplje-Zelenika	78	49	Maximum distance between stations 12 km. (8 miles).
216	Bosna Raca-Ogiljevic	45	28	
217	Obrenovac-Zabrezje	3	2	Train ferry across Boljevci Sava (4 km.; 3 miles from Boljevci) connects with Zabrezje across the Sava river.
218	Mladenovac-Valjevo	114	71	
219	Preljina-Donja Gorijevnica	8	5	
220	(Paracin-Stalac-) Krusevac-Cacak	95	59	From Paracin to Stalac and from Stalac to Krusevac, a third rail is used inside the standard gauge track. Maximum distance between stations 10 km. (6 miles). Maximum grade .7 percent. Maximum axle load 8.5 metric tons.
221	Cuprija-Ravna Reka	46	29	
222	Veliki Beckerek-Klarija	98	61	

Table 4 (cont'd)

		Length of line		
		km.	miles	Remarks
223	Zajecar-Paracin	128	80	Maximum distance between stations 10 km. (6 miles). Maximum grade 2.8 percent.
	Total	2,179	1,358	
II.	Gauge 1' 11 5/8"			
224	Vladicin Han-Surdulica	13	8	
225	Skoplje-Ohrid	234	146	Maximum distance between stations 11 km. (7 miles). Maximum axle load 5 metric tons.
226	Podmolje-Tasmoruniste	20	12	
	Total	267	166	
	Grand Total	2,446	1,524	

Table 5. PRIVATE YUGOSLAVIAN RAILROADS AND THEIR CHARACTERISTICS, 1944

Narrow Gauge Lines

		Length of line km.	Length of line miles	Remarks
I.	Gauge 2'5$\frac{1}{2}$"			
301	Zagreb-Samobor	20	12	
302	Prijedor-Knin	272	169	Maximum distance between stations 25 km. (16 miles). Passing loops available between many of the stations.
303	Srnetica-Jajce.	120	75	Operated by the Ministry of Forests and Mines. Maximum distance between stations 16 km. (10 miles). Maximum grade on rack section 4.5 percent.
310	Usora-Pribinic	40	25	
311	Zavidovici-Han Pjesak	119	74	
312	Semizovac-Ivancici	25	16	
313	Vogosca-Cevljanovic	23	14	
314	Koviljaca-Sabac	58	36	
315	Donja Plavnica-Podgorica	21	13	Line is connected with port of Donja Plavnica. Maximum distance between stations 4 km. (3 miles).
316	Bar-Virpazar	41	26	Line is connected with port of Bar. Maximum distance between stations 8 km. (5 miles).
317	Crnja-Julijin Majur	5	3	
318	Dubravica-Pozarevac-Petrovac	65	47	
319	Pozarevac-Kostolac	14	9	

Table 5 (cont'd)

		Length of line km.	miles	Remarks
320	Bor-Metovnica	17	11	
321	Skoplje-Orasie	18	12	
	Total	858	542	
II.	Gauge 3' 3 3/8"			
304	Osijek-Noskovci	100	62	Maximum axle load: Osijek to Dravska Obala 12 metric tons; Dravska Obala to Noskovci 10 metric tons.
305	Moslavina-Orahovica	22	14	
306	Cacinci-Kupnica	33	21	
307	Humljani-Slatinsci Drenovac	10	6	
308	Prandauovci-Belisce	18	11	
309	Donji Miholjac-Hungarian Frontier (-Harkany)	4	3	Change to standard gauge necessary at Hungarian Frontier. Maximum axle load 12.5 metric tons.
	Total	187	117	
	Grand Total	1,045	659	

Table 6. INTERNATIONAL CONNECTIONS WITH YUGOSLAVIA

Border station	Line	Connections	Maximum axle load metric tons
A. Italy			
Susak	401	Fiume-San Pietro del Corso (-Trieste and Postumia)	16
Rakek	402	Postumia-Trieste	16
B. Jezero	403	Piedicolle-Gorizia (-Trieste)	16
Ratece Planica	404	Tarvisio-Udine-Venice (-Trieste)	16
B. Austria			
Jesenice	405	Rosenbach-Villach-Munich; Rosenbach-Klagenfurt-Vienna	16
Prevalje	406	Bleiburg-Klagenfurt-Villach-Munich	16
Dravograd-Meza	407	Lauemund-Wolfsberg-Zeltweg-Leoben	14.5
Sent. Ilj	408	Spielfeld Strass-Graz-Bruck-Vienna	16
Gornja Radgona	409	Radkersburg-Spielfeld Strass (-Vienna)	14
C. Hungary			
Hodos	410	Lavidhaza Kotormany-Kormend-Szombamely-Vienna	12.5
Donja Lendava	411	(a) Redics-Zalaegerszeg-Ukk-Boba-Bratislava or (b) Redics-Czenstreg	12.5
Kotoriba	412	Murakenesztur-Nagykanisza; Szekesfehervar-Budapest; Zalaszentivan-Szombamely-Sopron-Vienna	16

Table 6 (cont'd)

Border station	Line	Connections	Maximum axle load metric tons
Koprivnica	413	(a) Gyekenyes-Somozyszob-Kaposvar-Pusztaszaboles-Budapest	20
	414	(b) Gyekenyes-Zakany-Barcs	16
Lukac	414	(a) Barcs-Somogyszob-Balatohszeht Gyorgy-Tapolcza	11.8
	414	(b) Gyekenyes-Zakany-Barcs	16
	414	(c) Barcs-Kozeprigoc; Kaposfo-Kaposvar; Szigetvar-Pecs; Sellye-Terehegy-Beremend	12.5
Noskovci	415	Dravastara Zalata-Dombovar-Budapest	12.5
Donji Miholjac	416	Dravaszabolcs-Harkany-Pecs	12.5
Petrovo Selo	417	Beremend-Terehegy (-Pecs)-Sellye-Kozeprigoc-Barcs	12.5
Beli Monastir	418	Magyarboli-Villany; Villany-Mohacs; Villany-Uszog (-Pecs)	16
Backi Breg	419	Herczegszanta-Baja	12.5
Ridica	420	Gara-Baja	12.5
Clegyens	421	Bacsalmas-Kiskunhalas (-Budapest)-Kiskunfelegyhaza-Szolnok	12.5
Subotica Salasi	422	Csikoria-Bacsalmas-Baja-Balaszek	16
Subotica	423	Kelebia-Kiskunhalas-Kiskoros-Ferencvaros-Budapest	20
Horgos	424	Kameras Suma-Szeged; Szeged-Vasarhaly-Orosnaza-Bekescsaba; Szeged-Kiskunfelegyhaza-Budapest	16
Dala	425	Vedroshaza-Szoreg-Mako-Ketegyhaza (-Bekescaba)-Eleka; Szoreg-Szeged-Budapest	12.5
Arondelovo	426	Szoreg-Szeged-Kiskunfelegyhaza-Kecskemet-Budapest; Szoreg-Mako-Ketegyhaza-Eleka	20

Table 6 (cont'd)

Border station	Line	Connections	Maximum axle load metric tons
D. Rumania			
Valkani	427	Valkani-Veche-Sanandrei-Periam-Timisoara (-Arad)	13.2
Nakovo	428	Comlosul Mare-Lovrin-Periam-Arad (-Timisoara)	13.8
Sveta Hubert	429	(a) Jimbolia-Gavosdia-Timisoara (b) Jimbolia-Lovrin-Mako (-Arad)	18 13.8
Klarija	430 431	(a) Jimbolia-Gavosdia-Timisoara (b) Jonel-Carpinis; Jimbolia-Arad-Alba Julia-Brasov-Bucharest	18 13.8
Nincicevo	431	Jonel-Carpinis	13.8
Jasa Tomic	432	Kruceni-Timisoara-Bucharest	13.8
Sucjac	433	Banicc-Jebel (-Voiteni-Timisoara)	13
Vatin	434	Voiteni-Timisoara-Bucharest	17
Velika Srediste	435	Veliki Zam-Gataia-Lugoj-Alba Julia-Brasov-Bucharest	13.8
Jam	436	Jam-Oravita-Anina (-Berzovia-Gataia)	17
Bela Crkva	437	Vrasov Caj-Bazias	16
E. Bulgaria			
Caribrod	438	Caribrod-Svilengrad	17
F. Greece			
Djevdjelija	439	Eyzenon-Salonika	18
Kremenica	440	Florina-Salonika (-Athens)	14

B. Track and Right of Way

1. Clearance. The clearance of Yugoslav standard-gauge railroads conforms with the regulations of the Central European Railroad Association (*Verein Mitteleuropäischer Eisenbahnverwaltungen*). The clearance of the narrow-gauge lines of 2'5½" is somewhat smaller than that adopted elsewhere for railroads of similar gauge.

2. Gauges. The greater part of the lines is standard-gauge (1.435 m.; 4'8½"). There is also a fairly well developed narrow-gauge system of lines which do not serve local needs only. Most of the narrow-gauge lines are of .76 m. (2'5½"). In addition there are a few lines with gauges of 1 meter (3'3-3/8"), and of 0.60 meter (1'11-5/8"). The lengths of standard- and narrow-gauge lines are given below:

	Km.	Miles
Standard-gauge lines	7,728	4,806
Narrow-gauge lines		
(a) Gauge: 2'5½"	3,034	1,898
(b) Gauge: 3'3-3/8"	190	119
(c) Gauge: 1'11-5/8"	267	166
Total narrow-gauge lines	3,491	2,183
Total lines	11,219	6,989

In some cases a third rail has been laid between the rails of standard-gauge lines, so that operation of narrow-gauge equipment is also possible. This somewhat unusual method has been used in particular to facilitate through traffic between the narrow-gauge lines in Serbia east and west of line 1.

3. Tracks Operated. All lines are single track with a few exceptions: Line 1 is double track from Rosenbach to Jesenice, and from Novska to Belgrade. Work is in progress to complete double tracking between Ljubljana and Novska. The Ljubljana-Zapresic and Zagreb-Dobovo sections have already been completed. South of Belgrade on line 1, the Belgrade-Ripanj Tunel and Veliko Plana-Lapovo sections are double track. In addition, lines 4 and 7 are double track. Double tracking is projected for the lines from Dugo Selo to Koprivnica (line 11), and from Pragersko to the Hungarian Frontier via Kotoriba (line 8). The length of double track lines is 621 km, (386 miles), 5.5 percent of the total length of lines.

The length of sidings and additional track is comparatively small in Yugoslavia. The total length of track in 1938 was 12,694 km. (7,456 miles), 133 percent of the total length of line. Corresponding figures for other railroad systems are as follows:

	Percentage of total length of track to total length of line
Yugoslavian National Railroad	133
Greek Railroads	114
Bulgarian National Railroad	127
Italian National Railroad	184
German National Railroad	226
Rumanian National Railroad	139
United States Railroads	
(a) Eastern Districts	214
(b) All Districts	168

Passing sidings on important routes, such as line 1, west of Belgrade, and lines 17 and 26, are between 500 and 600 m. (547 and 656 yards); on line 1 south of Belgrade and on line 45, they are between 400 and 500 m. (437 and 547 yards). This makes it possible to accommodate freight trains of about forty and fifty-five cars respectively, in addition to locomotive tenders and baggage cars. Sidings are shorter on less important routes.

4. Motive Power.

a. General. All lines are steam operated. Prior to the war projects were promoted by Italian and Yugoslav interests to electrify the Italo-Hungarian connection from Fiume to Budapest via Postumia, Zagreb, and Koprivnica (lines 4, 1, 17 and 11). If work on this project has been started at all, probably not much has been accomplished. Projects for the electrification of other lines in the northwestern area were also being considered.

b. Fuel. Fuel consumption in 1938 was as follows:

Briquettes	76,000 metric tons	(83,752 short tons)
Coal	223,000 " "	(245,746 " ")
Lignite	1,441,000 " "	(1,587,982" ")
Wood	7,000 " "	(7,714 " ")

The lignite used by the railroads is mined in the country. The main sources are mines in Trbovlje (between Ljubljana and Zagreb; line 1), Vrsac (near the Rumanian border; lines 36, 158), Zenica (line 203) and Breza (line 209). The lignite was rated at 3,500-5,500 calories per kilogram (6,300-9,900 B.T.U. per pound). Prior to the war lignite was mixed with briquettes or coal imported from Germany for fueling locomotives of the principal passenger and freight trains on standard-gauge lines. It is not known whether the importation of German coal has continued in recent years.

c. Lubricants. About 4,000 tons of lubricants were used in 1939. As in all Axis-dominated countries in recent years, supplies of lubricants have been small, and the lubricants of poor quality.

d. Water. The water supply is sufficient in most areas. In the river valleys, well and river water can be used, while water is more difficult to obtain in the mountains, because the rivers are deeply entrenched. In the northern plains difficulties may arise during droughts. There are about 500 supply points, of which 248 have independent mechanisms for raising the water, and 172 are equipped with ejector apparatus, which is operated by the steam of the locomotives -- a procedure which necessarily results in operating delays. In mountainous districts, hillside reservoirs supported by springs are located along the lines.

The quality of water varies. It is particularly hard on the Karst Plateau. It is also hard in the mountains of the Dinaric Alps. On the northern plains, river water is softer than well water, and water is soft in the Alps of the northwest.

The following figures give the quality of the water in various places:

Belgrade	Sava river water well water	187 p.p.m.[1] 525
Ljubljana		187
Zagreb		379
Podgorski		183
Celje		129
Karlovac		163

---

[1] Mineral content in parts per million. 1 p.p.m.=0.1 French degrees. Water of 100 p.p.m. is considered too hard in the United States.

Water columns are available at all the larger stations and roundhouses.

5. Ballast and Standards of Roadbed Construction. Methods of roadbed construction have varied considerably according to the stage of development of the Yugoslav system. The roadbeds of the lines originally built by the Austrian and Hungarian administrations were probably better constructed than those in other parts of the country.

Gravel and crushed stone of a thickness of 31.8-63.5 mm. ($1\frac{1}{4}$-$2\frac{1}{2}$") is used as ballast. In 1938, 252,000 cubic meters (8,899,000 cubic feet) of gravel, and 470,000 cubic meters (16,598,000 cubic feet) of crushed stone were used. The percentage of crushed stone was 62.1 percent on standard-gauge lines, 90.2 percent on lines of 2'$5\frac{1}{2}$" gauge, and 20.5 percent on lines of 1'11-5/8" gauge. The crushing of stones is done mostly by hand.

6. Rails.

a. Types. Rails are usually of the normal flat base vignole type, but there is a great variety of individual types. The dimensions of the two types most in use, S45a and 8b, are given below:

	S45a		8b	
	Mm.	Inches	Mm.	Inches
Height	142	5.6	138	5.4
Width of head	67	2.6	72	2.8
Width of web	14	.6	14	.6
Width of base	125	4.9	110	4.3

b. Weight. Rails of the S45a type weigh 45 kg. per meter (90 pounds per yard), and those of the 8b type 41 kg. per meter (82 pounds per yard). Rails on secondary standard-gauge lines weigh 15-30 kg. per meter (30-60 pounds per yard). The weight of rails on narrow-gauge lines of 2'5½" is 22.25 kg. per meter (44.5 pounds per yard), but rails of greater weight have also been laid on these lines. The proportion of heavy rails laid on main lines is small, and most lines have light rails. The distribution of rails on main lines by weight is given below:

	Percent
Over 53 kg. per meter (106 pounds per yard)	-
From 42.5-53 kg. per meter (83-106 pounds per yard)	15
From 37-42.5 kg. per meter (74-83 " ")	9
" 32-37 " " " (64-74 " " ")	27
" 20-32 " " " (40-64 " " ")	42
Under 20 " " " (40 " " ")	7
	100

c. Length. Rails of the S45a type have a length of

18 meters (60'), and those of the 8b type a length of 15 meters (50'). The length of the rails on 2'5½" lines is from 9 to 10.5 meters (29'6" to 34'6").

d. Joints and Other Track Material. Rails are fastened to the ties by plates, bolts, and screws of various types. Plates, bolts, and screws are also used on joints. On track laid with the S45a and 8b types of rails, the joint bars are flat, and the ties are bolted together.

Joints are squared; that is, the joints of the two rails are directly opposite each other, rather than staggered as on most U. S. lines.

7. Ties.

a. Wooden Ties. In 1938, 14,000,000 wooden ties were in use on the national lines. The length of the individual ties varied with the type of track used. Ties of various lengths were distributed as follows:

2.60-2.70 m. (8'6"-8'11")	21 percent
2.50 (8'3")	37
2.20-2.30 (7'3"-7'6")	24
1.20-1.70 (3'11"-5'7")	18
	100

62 percent of the ties were oak, 34 percent beech, and the remainder pine. The extensive use of hard wood is explained by the large supply available in Yugoslavia. Of the oak ties, 28.5 percent had been treated; all ties of other woods had

been treated. The railroad operated plants for the treatment of ties in Krusevac (line 220) and in Vitez (line 204); private companies operated those in Karlovac (lines 12 and 13), Slavonski Brod (line 1) and Hoce (line 6). The ownership of a plant in Susak (line 15) is not known.

About 1,760,000 ties were purchased in 1938, and 1,169,000 treated. The output of the plants was as follows: Krusevac, 420,000; Vitez, 355,000; Karlovac, 125,000; Brod, 68,000; Susak, 50,000; and Hoce, 150,000 pieces.

b. Steel Ties. In 1938 about 500,000 steel ties were in use on Yugoslav lines. They were usually laid at crossings, and sometimes under joints.

c. Spacing. The spacing of ties is often irregular. As a rule, ties on main lines are spaced at a rate of 26 per 18 meters, or 43 per 100 feet of track. The space between the centers of the first and second ties from the joint is 584 mm. (23") and that between the second and third is 813 mm. (32"). The maximum number of ties is 1,500 per km. (2,414 per mile).

8. Maintenance of Way and Structures.

a. State of Repair. Prior to the war the condition of the permanent way was below Central and Western European standards. Light rails were used extensively, and the relaying of rails was often postponed, even when rails were worn out. In 1933-34 the age of the rails was as follows:

Less than 5 years	17 percent
5-10 years	15 "
10-15 years	6 "
15-20 years	9 "
More than 20 years	53 "

In each of the years from 1934 to 1938, only sections of an average length of approximately 90 km. (56 miles), or less than 1 percent of the average total length of main track, were relaid for replacement and reenforcement. The minimum should have been between 2 and 3 percent. In addition, a comparatively small proportion of single rails was replaced in the course of regular maintenance work.

After the outbreak of war, the railroad lines suffered much damage from fighting and from constant sabotage. From time to time the lines were repaired as quickly as possible, and in the Croat area heavier rails were laid on various sections, particularly since the Germans insisted on keeping at least the strategic lines in a useable condition. It is obvious, however, that under the circumstances of war the general state of repair has become extremely poor.

In the mountainous regions, snow and heavy rainfall increase maintenance difficulties in winter and in spring. As far as is known, enough snowplow equipment was available prior to the war to keep most lines open all the year round.

b. Stocks and Availability of New Material. After the cessation of hostilities, stocks of rails and other track material will probably be exhausted. Steel track material for regular maintenance and replacements can be produced in the country if the steel mills, particularly those of Yugoslav Steel Ltd. in Zenica, known as "Zenica Krupp," are operating. It is doubtful, however, that the great volume of steel necessary for a general overhaul of the whole system, which is urgently needed, will be available without imports.

Prior to the war, great quantities of wooden ties were exported to other parts of Europe from the Bosnian forests. Ample material for replacement of ties will therefore be available when this area is accessible.

Hard rock for ballasting can be found in northeastern Bosnia, Serbia, and Slovenia; limestone and sandstone in parts of Slovenia, in Dalmatia, northern Bosnia, and Montenegro; and although there is a scarcity of hard rock in the Voivodina area (northern plains), gravel is abundant. Hence no difficulties exist for obtaining sufficient ballast material.

9. Grades and Curves.

a. Standard-Gauge Lines. Most of the standard-gauge lines were built on plains or in wide river valleys. It was therefore possible to avoid steep grades and sharp curves almost entirely. The ratio of level and straight sections is high, and the ratio of sections with steep grades and sharp curves is favorable, compared with various other railroad systems (Tables 7 and 8). On most Yugoslav standard-gauge lines, grades do not exceed 1 percent and curves are not sharper than 7°.

b. Narrow-Gauge Lines. Since many narrow-gauge lines are built in mountainous territory, the ratio of level and straight sections is much lower, and the ratio of sections with steep grades and sharp curves higher, than those on standard-gauge lines. The situation in general, however, is not very different from that on narrow-gauge lines in other European countries. On two lines, short sections are still operated by using rack and pinion. The characteristics of these sections are given below:

Line		Rack sections			
		Km.	Miles	Maximum grade percent	Maximum Curvature degrees
204	Bradina-Konjic[a]	26	16	6.0	$17^{\circ}5'$
303	Oborci-Goles	6.261	3,89	4.5	$11^{\circ}6'$

---

[a] Rack and adhesion sections alternate between Bradina and Konjic.

10. Bridges and Tunnels. The terrain features of Yugoslavia -- its mountainous regions and several rivers, notably the Danube and its tributaries, the Sava and the Drava -- have imposed obstacles to railroad construction, and necessitated many engineering works.

In 1938 there were approximately 5900 bridges more

Table 8. CURVES ON NATIONAL RAILROADS - 1938

	Length of Sections Yugoslavia		Percent of Total Length of Line				
	Km.	Miles	Yugoslavia	Germany	Italy	Rumania	Bulgaria
A. Standard-Gauge							
1. Straight Sections	5353	3326	73.2	66.7	68.9	77.0	65.1
2. Sections on Curves							
(a) With radius of 500 meters (1640.4 ft; 3°30') and over	901	560	12.3	20.7	18.5	10.5	15.4
(b) With radius less than 500 meters (1640.4 ft; 3°30')	1062	660	14.5	12.6	12.6	12.5	19.5
Total	1963	1220	26.8	33.3	31.1	23.0	34.9
Total Standard-Gauge	7316	4546	100.	100.	100.	100.	100.
B. Narrow-Gauge							
1. Straight Sections	1367	849	61.3	59.9	50.7	74.4	61.3
2. Sections on Curves							
(a) With radius of 500 meters (1640.4 ft; 3°30') and over	196	122	8.8	6.1	20.2	3.6	2.4
(b) With radius less than 500 meters (1640.4 ft; 3°30')	666	414	29.9	34.0	29.1	22.0	36.3
Total	862	536	38.7	40.1	49.3	25.6	38.7
Total Narrow-Gauge	2229	1385	100.	100.	100.	100.	100.
Grand Total	9545	5931	100.	100.	100.	100.	100.

than 2 meters (6.6') in length. About 3,300 bridges were of iron -- 300 of more than 30 meters (98.4'), and 3,000 from 2 to 30 meters (6.6 to 98.4') -- and 2,320 were concrete bridges -- 20 of these were more than 30 meters (98.4') long and 2,300 were from 2 to 30 meters (6.6' to 98.5'). There were only about 300 wooden bridges, all more than 2 meters (6.6') long. In addition there were 70 viaducts, and many culverts and small single-arch bridges. Most of the principal bridges are steel structures, built to German standards of construction. There are numerous strategically important bridges over the Drava on the lines connecting Austria and Hungary with Yugoslavia, and over the Sava on the main line (line 1), especially between Zemun and Belgrade. Large bridges have been built over the Danube at Novi Sad (line 26), at Bogojevo (line 22), and at Belgrade (the Pancevo Bridge) on the shortest route between the capital and Bucharest (line 36). The Borovnica Viaduct is an important structure on the line from Italy via Postumia (line 4).

In 1938 there were approximately 430 tunnels in Yugoslavia, the most important of which, the Karawanken (4 miles, 1,680 yds.) and the Wocheiner (almost 4 miles), are situated on international frontiers -- the former between Austria and Yugoslavia on the Orient Express line (line 1) and the latter between Italy and Yugoslavia on the line through Piedicolle (line 3). Other large tunnels are the Semis (line 12) and the Babuna (line 47).

Tunnels and bridges are frequent on a number of lines running to the coast, especially on the narrow-gauge Belgrade/Slavonski Brod-Sarajevo-Dubrovnik lines (lines 210, 213), and on the standard-gauge Zagreb-Split/Susak lines (lines 13, 15). In the south and southeast mountains and river valleys have necessitated an abundance of bridges and tunnels on: line 1 in the Morava and Nisava valleys, the Nis-Djevdjelija line (line 45) in the Morava and Vardar valleys, the Prahovo-Nis line (line 42) in the Timok valley, and the Lapovo-Kraljevo-Skoplje line (line 41) in the Ibar, Sitnica, and Lapovo valleys.

Such a large number of bridges and tunnels have made the system highly vulnerable, because many of the principal bridges are on vital international routes, and because tunnels and bridges have become fairly accessible targets for sabotage in the remoter regions.

11. Signal System. The signal system is highly inadequate. In 1938 there were 1732 stations and other stops on standard-gauge lines, and 426 stations and other stops on narrow-gauge lines. Only about 3500 semaphore and disc signals, however, were in operation. This indicates that not even all the stations on standard-gauge lines were protected from both directions by one home and one distant signal, and that there were some stations without any disc or semaphore signals at all. On main lines, signals indicating "caution" only were

widely used instead of distant and home signals. In addition approximately 2900 acoustic signals (probably bells which rang at the station and at the watchmen's houses along the line when the train left the station) were installed on many lines. On most European systems the colors of signal lights have been adjusted during the last decade: white was replaced by green to indicate "clear," and green by yellow to indicate "caution." In Yugoslavia the same change of colors was initiated prior to the war, but had not been finished at the end of 1938. Other improvements were made in the years preceding the war, such as the installation of new signals where no signals had existed at all, and of home and distant signals where only caution signals had been available. Color light signals were installed in a few places.

Prior to the war an automatic or semi-automatic block system and automatic train control devices were not in operation on any line. Modern interlocking apparatus in stations was also lacking almost everywhere.

Telephone or telegraph connections were available in most places.

12. Axle Loads. According to the Achsdruckverzeichnis (list of Axle Loads) of the Verein Mitteleuropäischer Eisenbahnverwaltungen (Association of Central European Railroads) a maximum axle load of sixteen or more metric tons is

permissible on a few lines or sections of lines in Yugoslavia. It is lower on all other lines (Tables 2-6).

13. New Construction. Before the war, the Yugoslav national railroads had planned a program for considerable expansion of the railroad system. It is doubtful, however, whether many of these works have been completed.

a. Lines under Construction.

501. Trzic-Austrian Frontier (-Ferlach), standard-gauge, 18 km. (11 miles). This line, providing a new Yugoslav connection with Austria, will be of considerable economic and military importance when completed.

502. Crnomelj-Vrbovsko, standard-gauge, 25 km. (16 miles). This connection will provide a second route from Zagreb to Susak and Fiume. Although it was scheduled to be completed by December 1940, it is probably still under construction.

503. Karlovac-Bihac-Knin, standard-gauge, 195 km. (121 miles). This line will provide a shorter and alternate route for the Zagreb-Split line from Karlovac to Knin, making this section of the line virtually double track. It will relieve the present Zagreb-Split line, which is frequently interrupted in winter owing to heavy snowfalls. Progress on this line has been very slow.

504. Senj-Bihac, standard-gauge, 85 km. (53 miles). This line will provide direct access to the Adriatic, forming

part of the projected transversal line south of the Jesenice-Belgrade-Caribrod line (line 1). This transversal will extend from the Adriatic to Stalac (on line 1) and will help to relieve line 1. No information regarding progress on the Senj-Bihac line is available.

505. Okucani-Banja Luka, standard-gauge, 55 km. (34 miles). This line will link Bosnia with the important Jesenice-Belgrade-Caribrod line and approaches to the north. The construction of a bridge across the Sava River is necessary. A report that the line has been completed is unconfirmed.

506. Banja Luka-Doboj, standard-gauge, 80 km. (50 miles). This line will also form part of the transversal line. Work started on this line in July 1941. It is reported to be near completion.

507. Kucevo-Negotin and Negotin-Kladovo-Romanian Frontier (-Turnul Severin), standard-gauge, 135 km. (84 miles). This line will form an important connection between Belgrade and Bucharest. Construction is progressing slowly.

508. Petrovac-Bor, narrow-gauge, 70 km. (44 miles). The extension of the narrow-gauge Pozarevac-Petrovac line to the Bor copper mines will be of considerable economic importance, providing direct rail communication between

Belgrade and the mines. A change of gauge at Pozarevac is necessary, however.

509. Kursumlija-Pristina, standard-gauge, 60 km. (37 miles). This is the uncompleted link between the Doljevac-Kursumlija and Pristina-Pec lines. The completed line will also provide a connection between the Nis-Skoplje and Kraljevo-Skoplje lines. It was to form a section of the proposed railroad from the Danube to the Adriatic across Central Serbia and Montenegro. Work on this line has been halted since the occupation.

510. Pirot-Leskovac, standard-gauge, 58 km. (36 miles). This line will provide a loop between the Orient Express line and the Nis-Skoplje line. Construction is reported to be in progress.

511. Kumanovo-Bulgarian Frontier (-Gyueshevo), standard-gauge, 70 km. (44 miles). This line will provide a short connection from Skoplje to Sofia. Recent reports indicate that the line is still under construction.

512. Kocane-Bulgarian Frontier (-Gorna Dzhumaya), standard-gauge, 60 km. (37 miles). This line will connect the Veles-Kocane branch of the Skoplje-Salonika route with the Struma Valley line in Bulgaria. Work was started late in 1941, but will not proceed with great speed until the standard-gauge line through the Struma Valley has been completed. A report that the Kocane-Gorna

Dzhumaya line has been completed is unconfirmed.

b. Lines Projected

601. Zlatar-Golubovec, standard-gauge, 7 km. (4 miles). This section will complete the through line from Varazdin to Ljubljana, decreasing the distance between these two points considerably.

602. Banova Jaruga-Garesnica, standard-gauge, 19 km. (12 miles). When this section is completed, it will connect the Bjelovar-Garesnica line with the highly important Dugo Selo-Novska line at Banova Jaruga, providing an additional through connection with the north.

603. Kocevje-Srpske Moravice, standard-gauge, 30 km. (19 miles). This line will provide a direct connection in Yugoslavian territory between Ljubljana and Susak and Fiume. It will also connect Ljubljana directly to Split. The distance from Ljubljana to these ports by rail will be decreased considerably.

604. Brcko-Tuzla-Sarajevo, standard-gauge, 130 km. (81 miles). This will be an important link in the north-south route connecting Hungary and Romania with the central Adriatic.

605. Simin Han-Valjevo-Cacak, standard-gauge, 160 km. (99 miles). This is the standard-gauge single track branch of the proposed west-east transversal line, which will extend from the Adriatic at Senj to Stalac (lines 504 and 506).

606. Foca-Bileca, narrow-gauge, 100 km. (62 miles). This is a continuation of the Ustipraca-Foca line, which will connect with the Hum-Niksic railroad, providing direct access to the important port of Dubrovnik. When the projected line from Trubjela to Kotor (line 607) has been completed, the Foca line will also connect with the port of Kotor.

607. Trubjela-Kotor, narrow-gauge, 45 km. (28 miles). This line will provide railroad access from Sarajevo and Belgrade to the port of Kotor.

608. Podgorica-Virpazar-Petrovac-Kotor, narrow-gauge, 53 km. (137 miles). This will be a continuation of the Danubian-Adriatic railroad, providing rail access to the ports of Virpazar, Kotor and Petrovac, and rail connections with the ports of Dubrovnik, Plavnica and Bar.

609. Raska-Prijepolje-Priboj (-Visegrad), narrow-gauge, 130 km. (81 miles). This narrow-gauge extension of an existing line will provide another west-east line, and a shorter route from Sarajevo to southeastern Yugoslavia.

610. Mitrovica-Rozaj-Podgorica-Kotor, narrow-gauge, 246 km. (153 miles). This line is the Adriatic link of the proposed Danubian-Adriatic railroad.

611. Kacanik-Strbce, narrow-gauge, 20 km. (12 miles). This projected line will run to the chrome mines near Strbce.

612. Struga-Albanian Frontier (-Elbasan), standard-gauge, 19 km. (12 miles). This line forms part of the project to connect railroads under construction in Albania with the Yugoslavian rail system.

613. Bor-Vrazogrnac, standard-gauge, 22 km. (14 miles). This will provide a standard-gauge connection between the Bor mines and the Nis-Zajecar line. It will be of considerable importance in providing rail connections that will obviate transshipment to barges.

Conversion of the Sarajevo-Gabela-Metkovic-Ploce line (lines 203, 206) from narrow- to standard-gauge is proposed in order to join it with the standard-gauge, north-south Brcko-Tuzla-Sarajevo connection, thus forming a complete standard-gauge line from Hungary to the Adriatic. Conversion of the Döboj-Simin Han and Cacak-Krusevac lines from narrow- to standard-gauge, so that it may form part of the proposed west-east standard-gauge line from Senj on the Adriatic to Stalac (lines 504, 506, and 605), is projected.

C. Equipment

1. Locomotives.

a. Pre-war Situation.

i. Locomotive Position in General. In 1938 there were 2,309 locomotives on the national lines, of which 1,603 were standard-gauge and 706 narrow-gauge (Table 9). In addition, there were ninety-five narrow-gauge locomotives on lines operated by the Ministry of Forest and Mines, and by private companies.

In 1940, before the invasion of Yugoslavia, the locomotive position on the national lines had not changed substantially, as is shown in Table 10.

Table 10. LOCOMOTIVE POSITION IN 1940

	Standard-gauge	Narrow-gauges		Total
		2'5½"	1'11"	
In service				
Passenger	204			
Mixed traffic	102			
Freight	958			
Total	1,264	429	119	1,808
Under repair	456	117	30	603
Total	1,720	542	149	2,411

ii. Types. When Yugoslavia took over Austrian and Hungarian lines after the first World War, she acquired a great variety of locomotive models, which were added to those

Table 9. LOCOMOTIVES AND RAILCARS OF THE YUGOSLAV NATIONAL RAILROADS - 1938

	Standard-Gauge Number	Narrow-Gauge Number
I. Locomotives		
A. Tender Locomotives		
2 coupled axles (2 pairs of drivers)	13	6
3 coupled axles (3 pairs of drivers)	751	115
4 coupled axles (4 pairs of drivers)	214	198
5 coupled axles (5 pairs of drivers)	103	-
6 coupled axles (6 pairs of drivers)	45	58
Total Tender Locomotives	1126	377
B. Tank Locomotives		
2 coupled axles (2 pairs of drivers	20	24
3 coupled axles (3 pairs of drivers)	449	94
4 coupled axles (4 pairs of drivers)	8	171
5 coupled axles (5 pairs of drivers)	-	2
6 coupled axles (6 pairs of drivers)	-	38
Total Tank Locomotives	477	329
Grand Total	1603	706
II. Railcars		
Special systems (Internal Combustion)	8	14

in use in Serbia. In the following period the administration tried to reduce the large number of types as much as possible. Because of lack of funds, however, old locomotives could be only slowly replaced by newer, standardized models.

(1) Standard-Gauge Locomotives. Prior to the war there were still about sixty different types of standard-gauge locomotives in use. Their average age in 1938 was stated to be 22.8 years.

Almost all standard-gauge locomotives were manufactured in Germany, Austria, or Hungary. After 1930, orders for standardized types with interchangeable parts were placed in Germany -- ninety-four of these locomotives had been delivered by 1940. Yugoslavia undertook to supply some of her own locomotive needs in the Slavonski Brod plant in 1939. This plant, however, was equipped to build only light standard-gauge and narrow-gauge locomotives.

(2) Narrow-Gauge Locomotives. Articulated types of narrow-gauge locomotives have been widely used, and some locomotives have considerable tractive power, but all of them are built for low speeds only. Almost all locomotives were imported from Central Europe.

iii. Plans for New Construction. In 1939 it was stated by the Minister of Communications that the locomotive supply was not sufficient to cover increasing traffic needs, and it was announced that 260 new locomotives would be purchased in the ensuing five years.

b. Present Situation. After the partition of Yugoslavia, the equipment was divided among railroads operating in various parts of the country.

During the war a small number of new locomotives have been built in the plant at Slavonski Brod. Some locomotives have been supplied by Germany. In 1941, fifteen 2-6-2 locomotives were under construction. But these acquisitions could not balance by far the great losses resulting from continuous warfare. Moreover, a certain number of over-age units had to be retired. The number of locomotives available at present is therefore considerably below pre-war figures. Consequently, a serious shortage of locomotives exists, and efficient train locomotives in particular are scarce.

2. Railcars. In 1938, eight standard-gauge and fourteen narrow-gauge railcars, -- a total of twenty-two -- were available (Table 9). The narrow-gauge cars are powerful enough to climb the rack sections on lines 204 and 303 as adhesion engines.

3. Passenger Cars. In 1938 the national railroad owned 3,558 passenger cars, of which 2,930 were standard- and 628 narrow-gauge. In addition there were about 200 cars on private lines (Table 11).

Most standard-gauge cars on national lines had two axles only, while cars on 2' 5½" lines usually had three or four axles, and all cars on 1' 11-5/8" lines had four axles. The seating capacity of standard- and narrow-gauge cars was 51.3 and 29.9, respectively. In 1940 the number of passenger cars had slightly declined, and no deliveries have been reported in recent years. Therefore the number of available cars is now considerably below the pre-war supply, owing to necessary retirements and losses through warfare.

4. Baggage and Mail Cars. In 1938 there were 1,521 baggage and mail cars (Table 11) on national lines. The situation in regard to baggage and mail cars is similar to that of passenger cars.

5. Freight Cars.

a. Pre-war Position.

i. Supply. In 1938 the national railroads owned 53,702 freight cars, of which 42,062 were standard-gauge and 11,640 narrow-gauge. In addition there were about 2,000 freight cars on private lines. Almost all standard-gauge freight cars were of the two-axle type (the average number of axles was 2.01). The average loading capacity was 15.3 metric tons (16.9 short tons). Most narrow-gauge freight cars had three or four axles. (The average number of axles was 3.47). Their loading capacity was 11.8 metric tons (13.0 short tons) (Table 12).

ii. Types. There was a great variety of freight cars for the several commercial purposes. In 1940 about 700

Table 11. PASSENGER, BAGGAGE AND MAIL CARS OF THE YUGOSLAV NATIONAL RAILROADS - 1938

	Passenger Cars		Baggage and Mail Cars	
	Standard-Gauge	Narrow-Gauge	Standard-Gauge	Narrow-Gauge
2 axles	2446	62	1032	56
3 axles	102	168	30	210
4 axles	379	398	112	81
6 axles	3	-	-	-
Total	2930	628	1174	347
Average Number of Axles per Car	2.3	3.54	2.21	3.07
Total Number of Seats	150,197	18,750		
Seating Capacity per Car	51.3	29.9		

Table 12. FREIGHT CARS OF THE YUGOSLAV NATIONAL RAILROADS - 1938

	Standard-Gauge		Narrow-Gauge	
	Number	Average Loading Capacity Metric Tons	Number	Average Loading Capacity Metric Tons
A. Box Cars				
2 axles	16,374		80	
3 axles	-		1,303	
4 axles	49		1,637	
Total	16,423	14.5	3,020	11.9
Average Number of Axles	2.01		3.51	
B. Open Cars				
2 axles	23,846		1,001	
3 axles	11		2,280	
4 axles	127		4,924	
Total	23,984	15.9	8,205	12.2
Average Number of Axles	2.01		3.48	
C. Special Cars	1,655	13.3	415	9.0
Average Number of Axles	2.01		3.1	
Grand Total Owned by National Railroads	42,062	15.3	11,640	11.8
Average Number of Axles per Car - All Cars	2.01		3.47	

tank cars, sixty cars fitted with snowplows, and twenty cranes were available on the standard-gauge lines.

Prior to the war, most freight cars had been imported from Central Europe, and a few from France and Belgium. The country's own production capacity is limited. Formerly, some cars were built in railroad shops. The plant at Slavonski Brod is of medium size, and the car factories at Jesenice, Krusevac, Kraljevo, Sarajevo and Smederovo are small.

b. Effects of War. During the war many cars have been destroyed, and a certain number have had to be retired. Production has continued at the various private plants, but new construction in railroad shops can hardly be maintained, owing to the heavy demand for repairs. Large scale imports have not been possible, because other Axis countries need their own output themselves. Therefore the number of freight cars has probably decreased in recent years, and would not be adequate to the traffic demands that may be expected after the cessation of hostilities.

6. Couplings and Buffers. Standard-gauge locomotives and cars have side buffers and screw couplings of the usual Continental European type. Narrow-gauge locomotives and cars have a central buffer and couplings.

7. Brake Systems. On those locomotives and cars fitted with continuous brakes compressed air systems are used almost exclusively. Most of the vacuum brake systems, which had been previously installed, were converted to compressed air.

However, vacuum brakes may still be used on some 1' 11-5/8" routes that are not connected with other lines. Locomotives are equipped with different types of compressed air brakes according to their make, such as Westinghouse, Kunze-Knorr, and Bozic. Passenger cars are equipped with compressed air brakes of various types.

Most freight cars are equipped with hand brakes. For a considerable time the problem of installing air brakes for Yugoslav freight cars was discussed, but negotiations with manufacturers of the different types did not lead to definite adoption of a uniform system. Prior to the war only a small proportion of the freight cars were equipped for air brake operation. These cars are used mostly for fast less-than-carload freight on passenger and freight trains. The number of standard-gauge cars equipped with air brakes is about 1,700, or 3.3 percent of the total number of freight cars. In addition 4,400 cars, or 8.8 percent of the total number, are equipped with pipes that make possible the circulation of compressed air between cars equipped with air brakes. Thus 12.1 percent of all cars were equipped for air brake operation. The systems installed on Yugoslav freight cars are certified by the International Railway Union for use in international traffic, and they work with those installed on foreign cars. If sufficient Yugoslav or foreign cars equipped with air brakes are available, whole trains or large sections of trains can be operated with air brakes, since the locomotives, also, have proper brake equipment. Difficulties might arise, however, if Yugoslav crews do not have the necessary training to handle such operations.

8. Maintenance of Equipment. Prior to the war, the high average age of locomotives and cars, the great number of obsolete units, and the great variety of types made adequate maintenance rather difficult, and only limited repair facilities were available for the growing railroad system. After the invasion of Yugoslavia the maintenance situation grew worse.

Owing to constant warfare, lack of proper lubrication, and many other irregularities, all equipment is now in poor condition, and it is impossible for the workshops to keep up with requirements.

D. Repair Facilities, Terminals, and Yards

1. Shops and Roundhouses (Map No. 5447). In 1938 there were five major workshops for the overhaul and more extensive repair of locomotives and cars. The Nis workshop is the largest in the country, and well-equipped. Slavonski Brod, where locomotives are built, has probably been improved for this purpose. The Smederevo workshop, completed in 1927, has comparatively new equipment. Maribor is an old shop; its capacity, however, has been increased in recent years. Narrow-gauge equipment is maintained at Sarajevo, which has modern installations. Some roundhouses were combined with running repair shops fitted with machinery for current maintenance of locomotives and cars. Most roundhouses, however, had no repair facilities of any size. Since 1941 workshops have suffered severely from warfare. On the other hand, it can be assumed that, under German direction, the Croat railroads have endeavored to improve the equipment of shops in their area.

2. Terminals. Large passenger terminals are located in Belgrade, Zagreb, Ljubljana, and Nis; considerable passenger traffic is also handled in Subotica, Novi Sad, Skoplje and Sombor.

3. Switching Yards. No modern classification yards exist in Yugoslavia. Fairly large switching facilities are available at major junctions. Smaller switching yards are found at other junctions, and at a few intermediate points.

E. Capacity

The capacities of Yugoslav lines are determined by the construction characteristics of the permanent way and equipment, which are discussed in the preceding sections. It should be emphasized that axle loads in general are low, according to European standards. Even when all war damage has been repaired, the capacities of the lines will be lower than those on Central and Western European railroads.

It can generally be assumed that, when equipment and crews are available, the following maximum number of trains can be operated daily: on double-track lines, fifty trains; on single-track principal lines, twenty trains; on standard-gauge secondary lines, fifteen trains, and on narrow-gauge lines, ten trains.

In 1937 the average freight train on standard-gauge lines consisted of approximately thirty-three cars, and its gross weight (including locomotive, tender, and baggage car) was 511 metric tons (563 short tons). The corresponding figure for the German National Railroad was 668 metric tons in 1937 (736 short tons). It is estimated that maximum net weights of freight trains exceed 500 metric tons (551 short tons) on only a few principal lines. They range between 200 and 450 metric tons (220-496 short tons) on other standard-gauge lines, and between 100 and 200 metric tons (110-220 short tons) on narrow-gauge lines. Higher performance figures may have been achieved in cases of war emergency under German pressure. They cannot be expected in regular operation.

E. Capacity

The capacities of Yugoslav lines are determined by the construction characteristics of the permanent way and equipment, which are discussed in the preceding sections. It should be emphasized that axle loads in general are low, according to European standards. Even when all war damage has been repaired, the capacities of the lines will be lower than those on Central and Western European railroads.

It can generally be assumed that, when equipment and crews are available, the following maximum number of trains can be operated daily: on double-track lines, fifty trains; on single-track principal lines, twenty trains; on standard-gauge secondary lines, fifteen trains, and on narrow-gauge lines, ten trains.

In 1937 the average freight train on standard-gauge lines consisted of approximately thirty-three cars, and its gross weight (including locomotive, tender, and baggage car) was 511 metric tons (563 short tons). The corresponding figure for the German National Railroad was 668 metric tons in 1937 (736 short tons). It is estimated that maximum net weights of freight trains exceed 500 metric tons (551 short tons) on only a few principal lines. They range between 200 and 450 metric tons (220-496 short tons) on other standard-gauge lines, and between 100 and 200 metric tons (110-220 short tons) on narrow-gauge lines. Higher performance figures may have been achieved in cases of war emergency under German pressure. They cannot be expected in regular operation.

F. Traffic

1. Passenger. The volume of passenger traffic on national railroads is reported as follows:

	Number of passengers (in millions)	Passenger kilometers (in millions)	Passenger miles (in millions)
1937	53.0	2,824	1,755
1938	56.3	3,016	1,874

After the invasion of Yugoslavia, train services were interrupted for long periods on many lines; passenger services were severely restricted on those lines open to traffic. Though figures for recent years are not available, it is certain that the volume of passenger traffic has greatly decreased. On private lines 1.8 million passengers, and 37.5 million passenger miles were reported for 1938.

2. Freight.

a. Volume. The volume of freight traffic on national lines is reported as follows:

	Metric tons (in millions)	Short tons (in millions)	Ton kilometers (in millions)	Ton miles (in millions)
1937	15.2	16.7	3,216	2,203
1938	15.4	17.0	3,350	2,295

On private lines 1.3 million metric tons (1,427 million short tons), and 73.0 million ton kilometers (50 ton miles) are reported for 1938. Since 1941 there has been a growing demand for freight transportation in many parts of the country. Total freight traffic, however, has declined for reasons previously noted in regard to passenger traffic.

b. Structure and Commodities Carried. Prior to the war the structure of freight traffic was influenced by the country's geographical position as an important bridge between the Balkans and other parts of Europe. The ratios of domestic and foreign traffic, given in Table 13, show a relatively high proportion of international traffic in 1938. The distribution of traffic by commodity groups in 1938 (Table 14) indicates that the greatest percentage of traffic consisted of agricultural and forest products, and products of mines. Manufactured goods were comparatively unimportant.

War conditions and the constant unrest in Yugoslavia have brought about changes in the structure of freight traffic. The flow of export traffic has shifted from lines leading toward the northern border points and ocean ports to those leading toward Danube ports. The surplus of agricultural commodities available for export has diminished with the increasing difficulty of feeding the country's own population.

Table 13. COMMODITIES CARRIED ON THE YUGOSLAV NATIONAL RAILROADS - 1938

Commodities	Percent
Products of agriculture	19.53
Animals and products	1.96
Coal, mineral oils	20.30
Metals, articles of metal	4.16
Other products of mines	21.79
Products of forests	22.60
Textiles and similar manufactures	1.31
Miscellaneous	8.35
Total	100.00

Table 14. DISTRIBUTION OF FREIGHT TRAFFIC ON THE YUGOSLAV NATIONAL RAILROADS, - 1938

	Tons	Ton kilometers (ton miles)
	(in percentages)	
I. Domestic	68.67	56.40
II. Foreign		
A. Export		
1. All rail	10.35	14.86
2. Port traffic	6.28	10.02
Total	16.63	24.88
B. Import		
1. All rail	2.84	2.30
2. Port traffic	1.41	2.82
Total	4.25	5.12
C. Transit		
1. All rail	10.45	13.60
2. Port traffic	--	--
Total	10.45	13.60
Total foreign[1]	31.33	43.60
Grand total	100.00	100.00

The government made great efforts to accelerate the production of such vital materials as bauxite, copper, chrome, lead and zinc, which have been exported in recent years. Great quantities of Romanian oil move in transit over Yugoslav lines into Italy as do Bulgarian exports into Italy and Central Europe. Industrial activities have not increased noticeably. Therefore, domestic shipments, although moving generally in much smaller quantities, have probably the same commodity distribution as in the pre-war period. Troop and supply movements within the country and in transit have at times added greatly to operating difficulties.

---

[1] These figures include only shipments moving at through bills of ladings and not those which were reshipped at border points by forwarding agents. The real volume of foreign traffic is therefore higher.

c. Seasonal Movements. Seasonal trends in pre-war freight traffic (Table 15) indicate the high traffic demand in the crop season from August through November. The ratio between basic and peak loads was unfavorable, and car shortages were severe during these months.

Table 15: AVERAGE MONTHLY FREIGHT CAR LOADINGS ON THE YUGOSLAV NATIONAL RAILROADS IN PERCENT OF TOTAL ANNUAL TRAFFIC 1936, 1937, 1938

January	6.4
February	6.5
March	7.7
April	7.4
May	7.8
June	7.9
July	8.7
August	9.6
September	10.0
October	10.7
November	9.3
December	8.0

G. Administration

1. Pre-war Situation. Before the German invasion of the Balkans, the Yugoslav national railroads were operated by a Director General, with headquarters in Belgrade, under the supervision of the Ministry of Communications. Division managements were located in Belgrade, Zagreb, Ljubljana, Sarajevo, and Subotica. The management of major workshops was directly supervised by headquarters. Private lines were operated by the Ministry of Forests and Mines, and private companies.

2. Situation after the Partition of Yugoslavia. After the partition of Yugoslavia in 1941, the national and private lines were divided approximately as follows:

Acquired by	Approximate length of line	
	Km.	Miles
Serbia (including Banat)	2,800	1,750
Croatia	5,000	3,100
Bulgaria	700	440
Germany	700	440
Italy	400	250
Hungary	1,100	690
Albania	500	310

The Serb railroads were still operated by a Director General with headquarters in Belgrade. A special German organization was established for managing the railroads of the Banat.

The new state of Croatia set up headquarters for the administration of the Croatian national railroads in Zagreb. Division managements ("directions") were established in Zagreb and Sarajevo. In the Zagreb region, district superintendents were located in Zagreb, Karlovac, Split, Koprivnica, Osijik, and Vincovci.

The railroads incorporated into the Bulgarian National Railroads were placed under the general supervision of the Minister of Railroads, Ports, and Telegraph, and operated by a Director General of Railroads and Ports with headquarters in Sofia. The regional inspectorate in Sofia, and an inspectorate in Skoplje, which were subordinate to the Director General, controlled the former Yugoslav lines.

The lines acquired by Germany were added to the area of the Division Management (Reichsbahndirektion) in Villach, and the lines taken over by Italy were probably placed under the control of the Division Management (Direzione Compartimentale) in Trieste.

The Hungarian National Railroads established a division management in Novi Sad.

3. Personnel. Personnel in the national railroads numbered about 81,000 in 1938. The division of functions is given in Table 16. In addition private companies employed about 3,000 persons. Prior to the war, Yugoslav railroad employees were considered fairly competent and efficient. The administration maintained staff schools in various places, and put great emphasis on proper training. However, much tension existed between the members of the various ethnic groups. This situation interfered to some extent with efficient teamwork.

During the periods of warfare many skilled railroad men have joined the armed forces and been replaced by less experienced persons. Moreover, after the partition of Yugoslavia, many employees who did not belong to the governing ethnic groups were dismissed or transferred to other areas. These developments have further decreased the efficiency of operations at a time when routine was already disrupted.

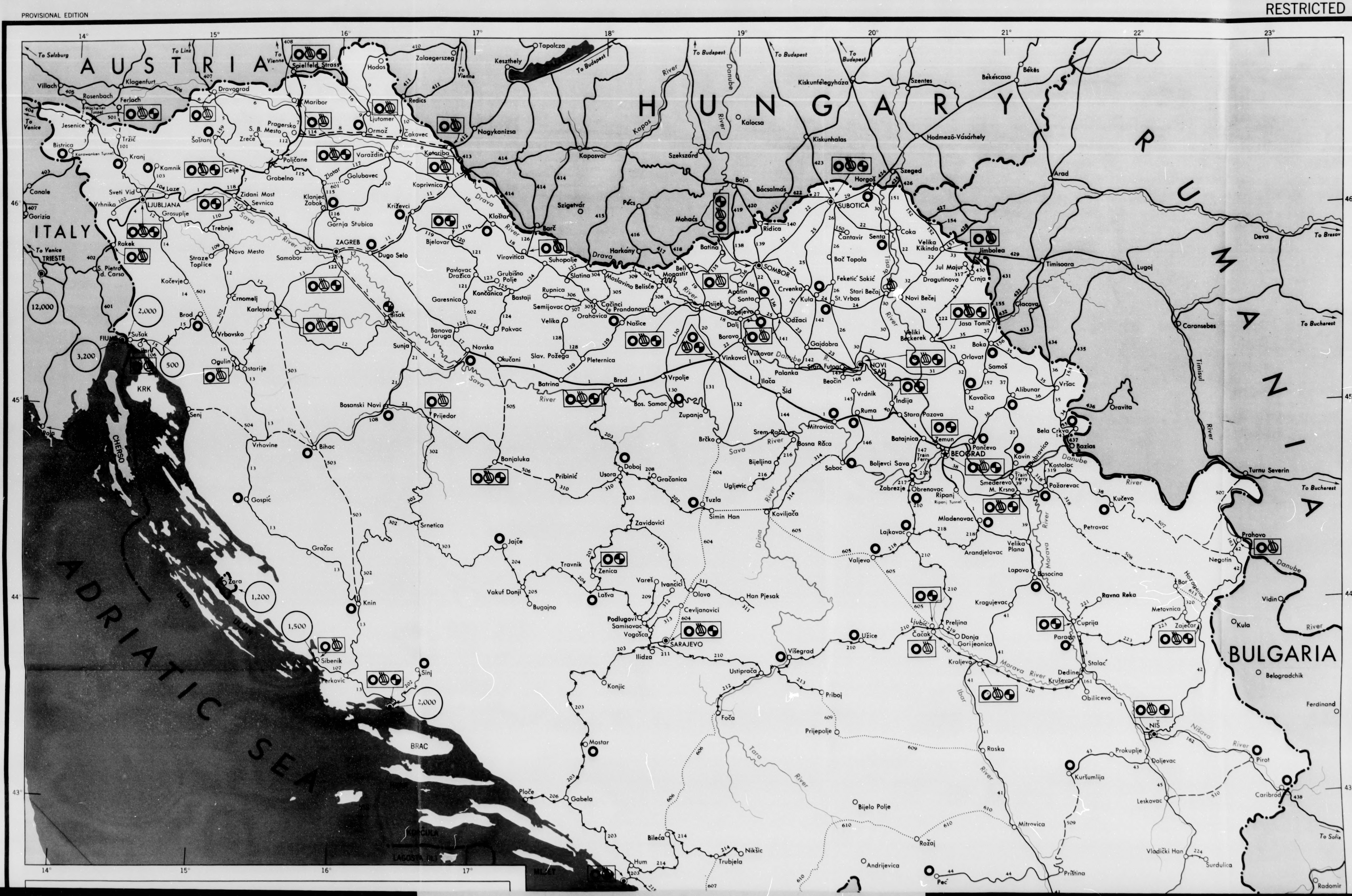
Table 16. DISTRIBUTION OF PERSONNEL OF THE YUGOSLAV NATIONAL RAILROADS, 1938

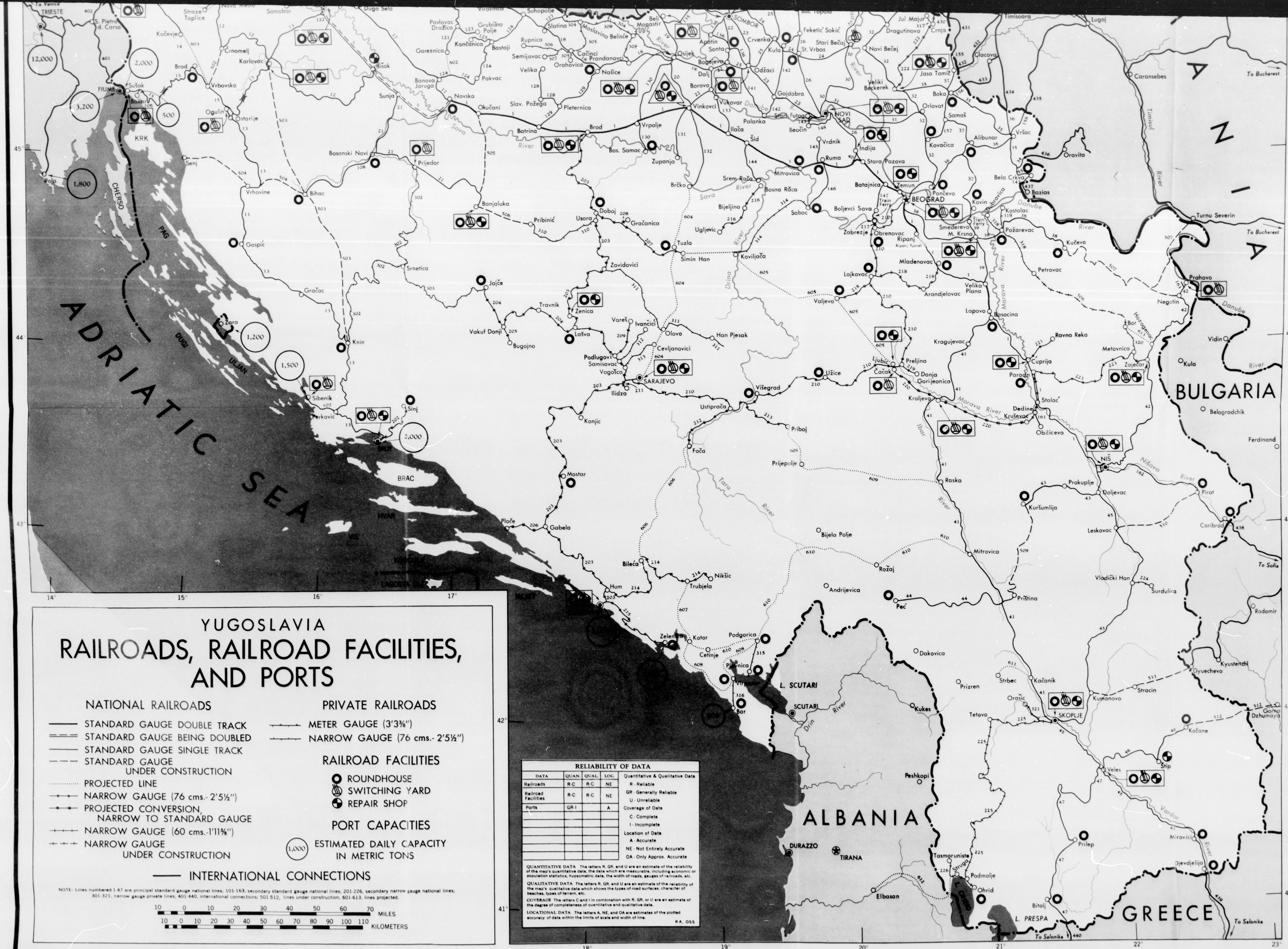
		Number	Percent of total
1.	Administration	4,144	5.13
2.	Maintenance of way and structures	26,112	32.31
3.	Station service	15,324	18.96
4.	Train crews	5,815	7.20
5.	Locomotive crews	5,227	6.47
6.	Current maintenance of equipment	11,990	14.84
7.	Major workshops	10,737	13.29
8.	Other services	1,457	1.80
		80,806	100.00

Due to its large size, the following document has been filmed in segments. The order of the segments is as follows: left to right, top to bottom.

PROVISIONAL EDITION

RESTRICTED


AUSTRIA
HUNGARY
RUMANIA
ITALY
BULGARIA
ADRIATIC SEA
To Salzburg
To Linz
To Vienna
To Budapest
To Venice
To Bresov
To Bucharest
To Sofia
Villach
Klagenfurt
Rosenbach
Ferlach
Jesenice
Bistrica
Dravograd
Spielfeld Strass
Maribor
Hodos
Zalaegerszeg
Keszthely
Tapolcza
Redics
Ljutomer
Pragersko
Ptuj
Ormož
Čakovec
Nagykanizsa
Varaždin
Koprivnica
Kotoriba
Celje
Kamnik
Kranj
Tržič
Šoštanj
Poljčane
Zidani Most
Sevnica
Ljubljana
Grosuplje
Vrhnika
Logatec
Rakek
Canale
Gorizia
Trieste
S. Pietro d. Carso
Kočevje
Novo Mesto
Straze Toplice
Trebnje
Samobor
Zagreb
Dugo Selo
Križevci
Bjelovar
Kloštar
Virovitica
Barč
Suhopolje
Kaposvar
Szigetvár
Pécs
Mohacs
Szekszárd
Kalocsa
Kiskunhalas
Kiskunfélegyháza
Szentes
Békéscsaba
Békés
Hodmezö-Vásárhely
Szeged
Arad
Horgoš
Baja
Bácsalmás
Subotica
Sombor
Senta
Kikinda
Jimbolea
Timisoara
Lugoj
Deva
Caransebes
Timisul River
Orsova
Turnu Severin
Sisak
Karlovac
Ogulin
Fiume
Sušak
Krk
Cherso
Senj
Bosanski Novi
Prijedor
Banjaluka
Bihac
Gospić
Gračac
Knin
Zara
Šibenik
Split
Sinj
Brač
Korčula
Lagosta
Mljet
Novska
Okučani
Brod
Slav. Požega
Našice
Osijek
Vinkovci
Vukovar
Novi Sad
Beograd
Zemun
Pančevo
Vršac
Bela Crkva
Smederevo
Požarevac
Doboj
Tuzla
Zenica
Sarajevo
Mostar
Gabela
Ploče
Bileća
Nikšić
Višegrad
Užice
Čačak
Kraljevo
Kragujevac
Valjevo
Šabac
Ćuprija
Paraćin
Stalać
Kruševac
Niš
Pirot
Caribrod
Leskovac
Prokuplje
Kuršumlija
Mitrovica
Priština
Peć
Vladički Han
Surdulica
Prahovo
Negotin
Zaječar
Vidin
Kula
Belogradchik
Ferdinand
Radomir
Drava River
Sava River
Danube River
Tisa River
Drina River
Morava River
Ibar River
Tara River
Nišava River
12,000
2,000
3,200
500
1,200
1,500
2,000
14°
15°
16°
17°
18°
19°
20°
21°
22°
23°
43°
44°
45°
46°


ADRIATIC SEA
ALBANIA
BULGARIA
GREECE
ANIA
BEOGRAD
SARAJEVO
SKOPLJE
FIUME
SPLIT
NOVI SAD
SOMBOR
NIŠ
SCUTARI
TIRANA
DURAZZO
L. SCUTARI
L. PRESPA
OHRID
KRK
CHERSO
PAG
DUGI
ULJAN
BRAC
HVAR
VIS
Sava River
Danube River
Drina River
Morava River
Vardar River
To Venice
TRIESTE
To Bucharest
To Sofia
To Salonika
12,000
3,200
2,000
500
1,800
1,200
1,500
2,000

YUGOSLAVIA

RAILROADS, RAILROAD FACILITIES, AND PORTS

NATIONAL RAILROADS

- STANDARD GAUGE DOUBLE TRACK
- STANDARD GAUGE BEING DOUBLED
- STANDARD GAUGE SINGLE TRACK
- STANDARD GAUGE UNDER CONSTRUCTION
- PROJECTED LINE
- NARROW GAUGE (76 cms.-2'5½")
- PROJECTED CONVERSION, NARROW TO STANDARD GAUGE
- NARROW GAUGE (60 cms.-1'11⅝")
- NARROW GAUGE UNDER CONSTRUCTION

PRIVATE RAILROADS

- METER GAUGE (3'3⅜")
- NARROW GAUGE (76 cms.-2'5½")

RAILROAD FACILITIES

- ○ ROUNDHOUSE
- SWITCHING YARD
- ◐ REPAIR SHOP

PORT CAPACITIES

(1,000) ESTIMATED DAILY CAPACITY IN METRIC TONS

—— INTERNATIONAL CONNECTIONS

NOTE: Lines numbered 1-47 are principal standard gauge national lines; 101-163, secondary standard gauge national lines; 201-226, secondary narrow gauge national lines; 301-321, narrow gauge private lines; 401-440, international connections; 501-512, lines under construction; 601-613, lines projected.

10 0 10 20 30 40 50 60 70 MILES

10 0 10 20 30 40 50 60 70 80 90 100 110 KILOMETERS

RELIABILITY OF DATA

DATA	QUAN.	QUAL.	LOC.
Railroads	R-C	R-C	NE
Railroad Facilities	R-C	R-C	NE
Ports	GR-I		A

Quantitative & Qualitative Data
R - Reliable
GR - Generally Reliable
U - Unreliable
Coverage of Data
C - Complete
I - Incomplete
Location of Data
A - Accurate
NE - Not Entirely Accurate
OA - Only Approx. Accurate

QUANTITATIVE DATA The letters R, GR, and U are an estimate of the reliability of the map's quantitative data, the data which are measurable, including economic or population statistics, hypsometric data, the width of roads, gauges of railroads, etc.

QUALITATIVE DATA The letters R, GR, and U are an estimate of the reliability of the map's qualitative data which shows the types of road surfaces, character of beaches, types of terrain, etc.

COVERAGE The letters C and I in combination with R, GR, or U are an estimate of the degree of completeness of quantitative and qualitative data.

LOCATIONAL DATA The letters A, NE, and OA are estimates of the plotted accuracy of data within the limits of scale and width of line.

R A, OSS

NO. 5447—R & A, OSS
22 NOVEMBER 1944

RESTRICTED

LITHOGRAPHED IN THE REPRODUCTION BRANCH, OSS

2561.1

Offa. p. 67

+83.